

INCIDENT BRIEF

June 2025

The May-June 2025 Central Canada Fires: National Challenges of a Warming Climate and Cascading International Impacts

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Highlights

- 1. Early & Explosive Start:** Canada has witnessed a significant increase in the annual area burned and the number of large fires since the mid-20th century¹. The 2025 wildfire season has continued this alarming trajectory, with an explosive start characterized by significant early activity burning over 2.7 million hectares by June 8, directly exposing over 6,000 people to fire with an additional 28,000 people affected within a 5 km buffer from the fire perimeters..
- 2. Severe Social Disruption, Human Cost & Strained Resources:** While >150 times larger in area than the 2025 Los Angeles fires², direct human exposure to Canadian fires was much lower due to remoteness. Nevertheless, these fires caused evacuation of over 33,000 people by June 8, including entire communities like Flin Flon, Manitoba. Tragically, two civilian fatalities were reported in Lac du Bonnet, Manitoba, in mid-May³. Limited infrastructure and scarcity of shelter stressed both displaced individuals and host communities. States of emergency were declared in Manitoba and Saskatchewan. The remote and Indigenous communities faced acute challenges.
- 3. Climate Change as a Significant Amplifying Driver:** The fires are a stark manifestation of a warming climate. Conditions were exacerbated by a warm, dry winter and spring (Jan-Apr 2025 temperatures >2.5°C above average) and a stationary high-pressure system⁴. Climate change made the extreme heat more likely, lengthening fire seasons and intensifying wildfire behavior⁵.
- 4. Cascading Transboundary Impacts:** Smoke created a significant air quality crisis across Canada, extending deep into the United States, and reportedly even reaching Europe. On June 2, 2025, over 2 million people in Canada and over 117 million people in the USA were exposed to heavy smoke (though not all at the ground level) highlighting the international dimension of these wildfires. Cumulative smoke exposure since the start of these fires was multiple times larger.
- 5. Significant Economic Toll:** While direct costs are still being tallied, the scale of burned land, disruption to industries, and the immense cost of firefighting and evacuation point to a substantial economic impact. Long-term costs of recovery and health impacts will further escalate the wildfires' societal burden.
- 6. Community Preparedness & Ignition Control Measures:** To mitigate fire risks, an all-in effort in community preparedness is essential. This includes reinforcing Fire Smart principles⁶ around homes and critical infrastructure, while authorities must enforce comprehensive fire bans and prevent potential human-caused ignition sources.
- 7. Resilience and Mitigation Enhancement:** Canada's wildfire crises emphasize the critical need for improved societal resilience, better evacuation systems, robust support for displaced populations, and proactive wildfire prevention. Strengthening resilience to wildfire smoke is also paramount.

Context

In mid-May 2025, central Canada faced a sharp increase in wildfire activity, with blazes raging across Saskatchewan that spread to Manitoba, and as of May 29, also impacting Alberta and British Columbia. Fueled by unusually hot, dry, and windy conditions, these fires rapidly expanded, prompting Manitoba (May 28) and Saskatchewan (May 29) to declare states of emergency. These wildfires prompted more than 33,000 people to evacuate their homes, including the complete evacuation of Flin Flon, a city of 5,000 in Manitoba near the Saskatchewan border, as flames approached residential areas. The Canadian Armed Forces assisted in airlifting residents from remote areas, particularly from northern Indigenous communities where access was limited. Smoke from these fires drifted southward, affecting air quality in large swaths of the United States. While the ignition sources for these fires are not yet determined, the blazes burned through dry vegetation curated by severe to extreme drought. These events underscore the escalating challenges posed by climate change-induced wildfires, highlighting the need for enhanced emergency preparedness and international cooperation in wildfire management.

Findings

This Incident Brief by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) provides a rough estimate of the human exposure to the current (May-June, 2025) wildfires in Canada and wildfire smoke in Canada and United States using wildfire perimeter data from the Canadian Wildland Fire Information System (derived from AVHRR, MODIS and VIIRS satellite imagery, and NASA Firms platform), the U.S. National Oceanic and Atmospheric Administration’s Hazard Mapping System (based on Geostationary and VIIRS satellites), the North American Land Change Monitoring System’s land cover product, and gridded population data by WorldPop. The analysis indicates that, as of June 8, 2025, the direct exposure to central Canada wildfires was more than 6,000 people, and an additional 28,000 people lived within a 5 km distance from the wildfires but not within the burned perimeters. The latter group were not directly exposed to flames, but faced secondary impacts such as evacuations. Additionally, smoke plumes from these fires have covered large swaths of Canada and USA, with smoke coverage changing daily. On June 2, 2025, over 117 million people in the USA and >2.7 million people in Canada were exposed to heavy smoke plumes, noting that smoke might have been in high altitudes and not directly on the ground. Nevertheless, large areas of the USA from midwest to southeast observed ground-level air quality levels in the range of moderate to unhealthy for sensitive groups due to smoke from central Canada fires.

As of June 8, 2025, central Canada fires that started in mid-May have burned >2.7 Million hectares of vegetated land— nearly 7 times the cumulative burned area in Canada in 2025 prior to these events⁷. The fires started during severe to extreme drought conditions and burned through northern, mesic ecosystems, consisting of forests (nearly 64% of burned area; mainly boreal forest but also including temperate forest), wetlands (nearly 23%) and grasslands (over 13%).

Table 1. Daily human exposure to wildfire smoke in Canada and the USA. Areas covered by light, medium and heavy smoke are assessed separately, noting that smoke plume might occur at high altitudes and not necessarily on the ground

	Number of People (x1,000) Exposed to:					
	Light Smoke		Medium Smoke		Heavy Smoke	
	Canada	USA	Canada	USA	Canada	USA
May 25, 2025	1,627	3,712	1,116	5,557	90	14
May 26, 2025	3,012	7,375	1,807	185	152	0
May 27, 2025	6,067	1,905	1,057	2	65	0
May 28, 2025	10,655	4,654	5,972	330	952	5
May 29, 2025	3,413	69,700	1,923	822	809	20
May 30, 2025	5,103	19,150	986	14,647	1,980	8,132
May 31, 2025	21,714	103,377	1,339	63,920	2,737	97,393
June 1, 2025	14,527	87,941	3,660	50,426	2,712	111,461
June 2, 2025	18,172	87,661	15,359	78,053	2,772	117,330
June 3, 2025	3,244	55,262	27,068	176,487	1,696	0
June 4, 2025	21,199	195,904	10,904	10,511	274	0
June 5, 2025	1,755	79,031	29,187	63,249	1,913	0
June 6, 2025	1,422	185,243	25,547	77,222	847	135
June 7, 2025	4,481	236,330	27,354	8,085	105	2
June 8, 2025	11,229	188,684	20,098	22,291	0	0

Drivers

Wildfires fundamentally depend on the availability, continuity, and density of dry fuels, as well as a source of ignition to initiate combustion⁸. In forested and grassland ecosystems, the build-up of fine fuels such as dried grasses, shrubs, leaf litter, and fallen branches provides the material necessary for fires to ignite and spread. The continuity of these fuels determines how easily a fire can move through the environment, while their density affects the intensity and heat release of the flames. The ignition sources can be natural, such as lightning, or human-caused, including campfires, discarded cigarettes, or powerline sparks.

Lengthening dry spells and rising temperatures associated with climate change further exacerbate wildfire risk by curating an abundance of dry, flammable fuels. Prolonged

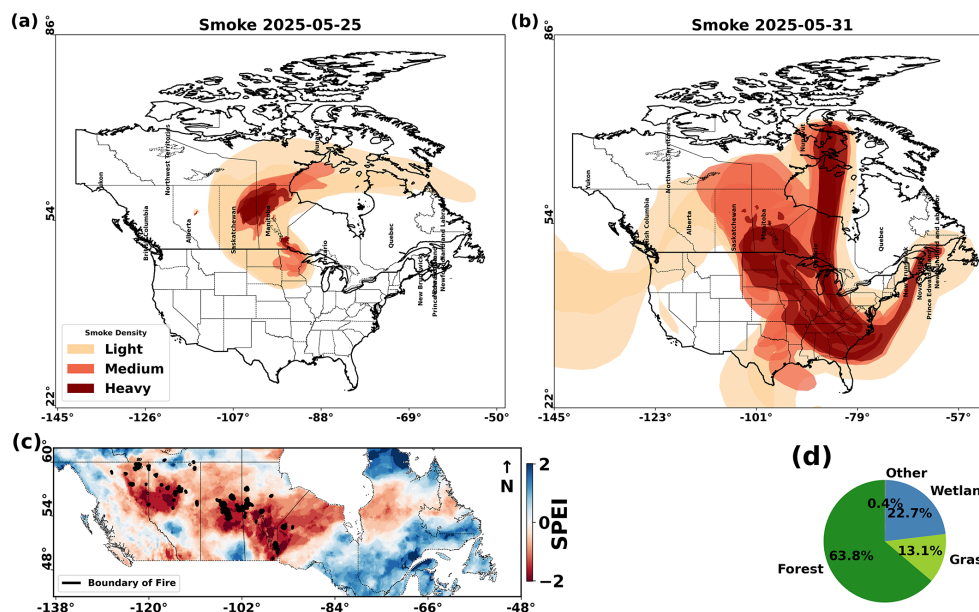


Figure 1. Central Canada fires as of June 8, 2025. Wildfire smoke plumes covering large swaths of Canada and the USA on (a) May 25 and (b) May 31, 2025. (c) Drought status based on the Standardized Precipitation Evapotranspiration Index (SPEI – 2-month aggregation ending in May 24, 2025, with respect to the 1991-2020 data). (d) Fraction of burned area by the general land cover class. In (a)-(c), burned areas are shown in black.

drought conditions desiccate vegetation, while heat waves lower humidity levels, increasing fuel flammability. This creates a feedback loop in which fires become more likely and harder to control. Additionally, warming temperatures can expand the fire season, increasing the window of vulnerability for ignition and fire spread.

To address these growing risks, fire mitigation strategies increasingly focus on fuel management and proactive forest treatments⁹. Techniques such as mechanical thinning and prescribed burning are employed to reduce fuel loads, decrease fuel continuity, and create fire breaks. These practices limit the intensity and rate of fire spread, providing critical windows of opportunity for suppression efforts. However, fuel treatments must be carefully planned to account for ecosystem characteristics; in mesic systems, for example, where moisture retention is high, such interventions may be less effective. Alongside fuel management, fire prevention remains essential¹⁰. Measures such as fire bans during high-risk periods, public education campaigns on fire safety, and investments in early detection and rapid response systems can reduce ignition risk and limit the potential for fires to escalate. By integrating these approaches, society can enhance its preparedness and resilience against the increasingly frequent and severe wildfires driven by climate change.

Recommendations

Wildfire suppression in carbon-rich, northern latitude ecosystems, such as the boreal forests and peatlands, is

particularly challenging due to the unique characteristics of these mesic systems. Once ignited, these densely vegetated systems burn with high intensity, rendering suppression efforts both arduous and resource-intensive. In addition to proactive fire prevention strategies, investing in technology and human resources for early fire detection and rapid response, particularly at the initial stages of ignition before fires gain momentum, can enhance suppression effectiveness, acknowledging this is challenging in remote areas. Air response plays a crucial role in controlling raging wildfires, allowing for rapid delivery of water and retardants to areas inaccessible by ground crews. However, high winds and dense smoke can ground aircraft, while unauthorized drone flights can pose significant safety risks, disrupt operations, and delay critical firefighting efforts. Community cooperation, including adherence to no-fly zones and public awareness campaigns, is essential to ensure air response teams can operate safely and effectively. International sharing of wildfire suppression and response resources is essential during wildfire disaster periods, particularly as the timing of peak fire activity often varies between countries, allowing for the strategic deployment of personnel, equipment, and aircraft to where they are needed most. This cooperative approach enhances collective resilience, reduces response delays, and maximizes the effectiveness of suppression efforts in managing increasingly frequent and severe wildfires.

Even more important is enhancing societal preparedness to respond effectively to increasingly frequent and severe wildfires. Home hardening is a critical strategy to mitigate

wildfire risks, particularly in the wildland-urban interface where human developments meet flammable landscapes. Home hardening refers to the process of making homes and structures more resistant to ignition by using non-combustible building materials, installing ember-resistant vents, and creating defensible space around properties². This reduces the chances of structures igniting from embers or direct flames during a wildfire. In addition to individual home hardening, communities play a vital role in reducing wildfire risk through vegetation management. This includes maintaining defensible zones by clearing flammable vegetation around homes. Community-wide planning, such as establishing fire-safe councils, enforcing building codes, creating evacuation routes, and conducting regular fire drills, can collectively strengthen resilience and preparedness for wildfires.

It is also imperative to invest in the development of resilient infrastructure¹¹. This includes designing fire-resistant power and communication systems, establishing reliable aerial evacuation frameworks with support from national resources such as the army and emergency services, and pre-positioning equipment and personnel in high-risk areas. Equally important is the creation of wildfire shelters within remote communities to serve as refuges when evacuation routes are compromised by encroaching fires and dense smoke, particularly during periods of synchronous wildfire activity when resources are stretched thin. This integrated approach can bolster the safety, preparedness, and resilience of northern and Indigenous communities increasingly vulnerable to wildfire threats.

Wildfire evacuations present significant challenges for both evacuees and host communities. Vulnerable populations, including the elderly, those with chronic illnesses, and individuals requiring specialized medical equipment or assistance, face heightened risks during evacuation due to limited access to essential services and physical barriers to mobility. Simultaneously, receiving communities often struggle with resource shortages, strained healthcare systems, and disruptions to local infrastructure, creating tensions and potentially leaving the most at-risk populations without necessary support. To address these challenges, national-level policies must focus on enhancing evacuation preparedness and shelter capacity, particularly for vulnerable groups. This includes equipping shelters with essential medical supplies and mobility resources, training staff to manage specialized care needs, and ensuring dynamic allocation of emergency funding, while fostering national cooperation to effectively accommodate evacuees during disaster events.

Wildfire risk extends far beyond those directly exposed to flames, with smoke impacting a much larger population,

both in the short and long term. Exposure to wildfire smoke has been linked to increased mortality, especially among vulnerable populations such as the elderly and those with pre-existing respiratory or cardiovascular conditions¹². In the short term, wildfire smoke leads to a surge in emergency room visits, hospital admissions, and increased use of both over-the-counter and prescribed medications for asthma, bronchitis, and heart conditions, among others. Long-term exposure can exacerbate chronic diseases and impair lung function. To mitigate these impacts, public health measures must prioritize raising awareness about the dangers of wildfire smoke, encouraging reduced outdoor activities during smoky periods, and promoting the use of air filtration systems and high-quality masks like N95 respirators. Community planning should also emphasize creating “clean air shelters” and providing accessible resources for those most at risk. These proactive strategies are essential for protecting public health as wildfire activity and associated smoke events become more frequent and severe.

Final Remarks

Wildfires present profound challenges for remote communities, where limited evacuation infrastructure and sparse road networks make safe and timely escape difficult, particularly during rapidly spreading fires. Indigenous communities are especially vulnerable, given their close relationship with the land, often isolated locations, and reliance on traditional knowledge systems that can be disrupted by fire. Many remote settlements lack multiple evacuation routes, and air evacuation may be the only viable option during emergencies. However, logistical constraints, unpredictable weather, and the scale of wildfires can hamper aerial evacuation efforts. Furthermore, critical infrastructure such as power lines, communication networks, fuel depots, and water systems are increasingly exposed to wildfires in these regions. When such infrastructure fails, it can lead to cascading impacts, leaving entire communities cut off from essential services also hampering firefighting efforts.

Wildfires’ secondary effects, particularly smoke, can affect vast populations far beyond the fire zones. Wildfire smoke contains harmful pollutants such as fine particulate matter (PM_{2.5}) and volatile organic compounds, which can travel hundreds or even thousands of kilometers, impacting air quality and human health across national and international borders. This problem has been amplified by the increasing frequency and severity of wildfires, especially in northern latitude boreal forests and carbon-rich ecosystems. Rising temperatures and prolonged dry spells driven by climate change have made these ecosystems more susceptible to large-scale fires, turning them from carbon sinks into net sources of carbon in the short term. The burning of peatlands and dense organic soils releases massive amounts of carbon

dioxide and methane, contributing to a dangerous feedback loop of global warming and increased fire activity. These escalating fires not only threaten local communities but also degrade air quality on a continental scale, underscoring the urgent need for international cooperation and climate action. Curbing global temperature increases is critical to mitigating wildfire risks, particularly in the boreal regions, where the resilience of carbon-rich ecosystems is vital for global carbon balance and long-term climate stability.

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Acknowledgement: Financial support from the U.S. Joint Fire Science Program, the U.S. National Science Foundation, and Global Affairs Canada is appreciated.

Open Research: We obtained fire perimeters as of June 8, 2025 from the Canadian Wildland Fire Information System available at <https://cwfis.cfs.nrcan.gc.ca/datamart/metadata/fm3buffered>, which is based on the NASA FIRMS platform: <https://firms.modaps.eosdis.nasa.gov/usfs/map/>. We obtained smoke hazard maps from the U.S. National Oceanic and Atmospheric Administration's Hazard Mapping System. For evaluating population exposure to wildfire and smoke, we employed gridded population estimates from WorldPop (<https://www.worldpop.org/>).

doi: <https://doi.org/10.53328/INR25MOS004>
ISBN: 978-92-808-6125-9

Disclaimer: The views and opinions expressed in this paper do not necessarily reflect the official policy or position of the United Nations University.

*Recommended Citation: Seydi S. T., Abatzoglou J. T., AghaKouchak A., Madani, Matin, M., K. Sadegh M., (2025), The 2025 Central Canada Fires as of June 8: National Challenges of a Warming Climate and Cascading International Impacts UNU Institute for Water, Environment and Health (UNU-INWEH), Richmond Hill, Ontario, Canada.
doi: <https://doi.org/10.53328/INR25MOS04>*